Jun 28th, 4:05 PM - 4:25 PM

Session B6- The Bridgeport solution: Pool and weir fishway retrofit for a Pequonnock River culvert inlet transition

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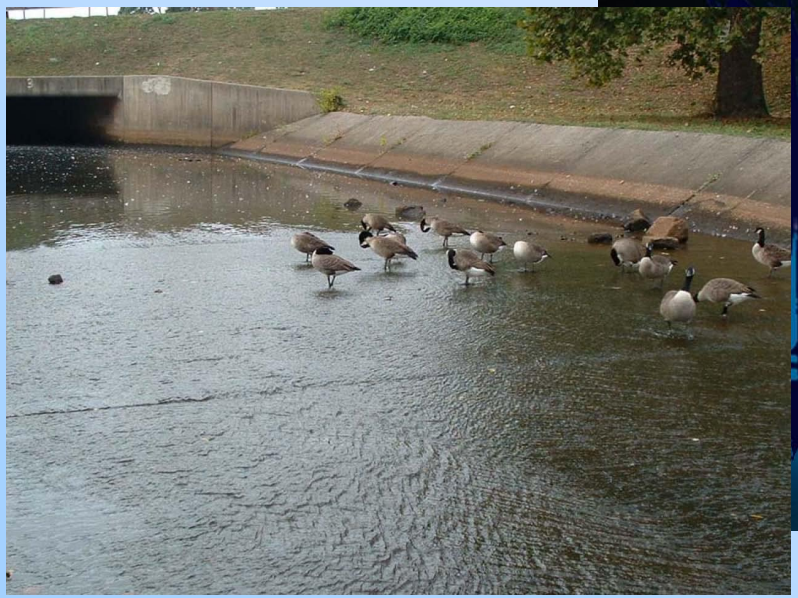
The Bridgeport Solution

Pool and Weir Fishway for the Pequonnock River

Save the Sound®
A program of
Connecticut Fund for the Environment



Prepared for:
Fish Passage 2011
June 2011

NOAA
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
U.S. DEPARTMENT OF COMMERCE

RESTORE AMERICA'S ESTUARIES

CONNECTICUT DEPARTMENT OF ENVIRONMENTAL PROTECTION

Project Partners

Save the Sound – A Program of Connecticut Fund for the Environment (STS)

National Oceanic and Atmospheric Administration (NOAA)

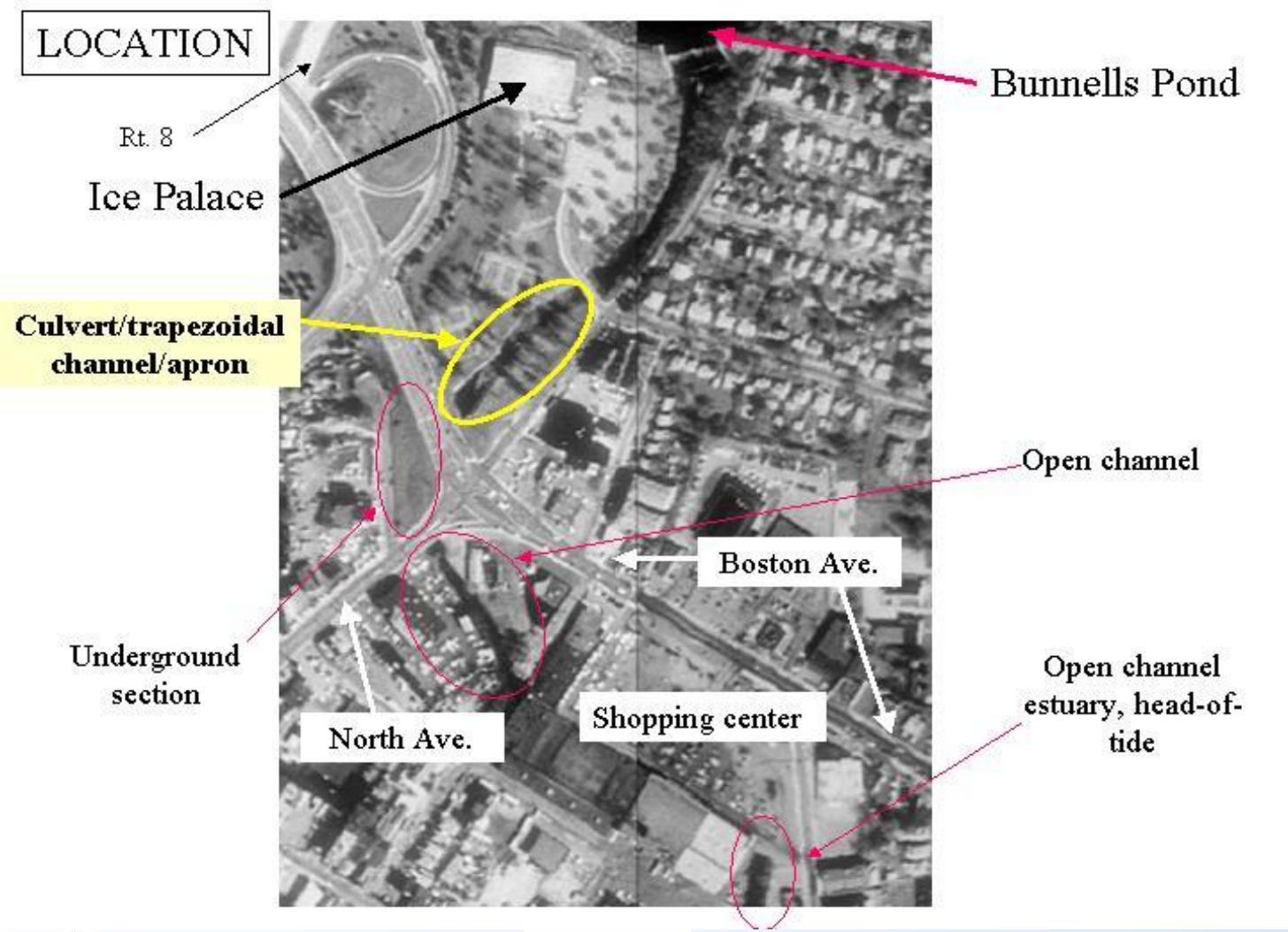
Restore America's Estuaries

Connecticut Department of Environmental Protection (CTDEP) – Inland Fisheries Division

Other Project Partners:

US Fish and Wildlife Service (USFWS)
City of Bridgeport
Connecticut Department of Transportation
EA Engineering, Science, and Technology, Inc.

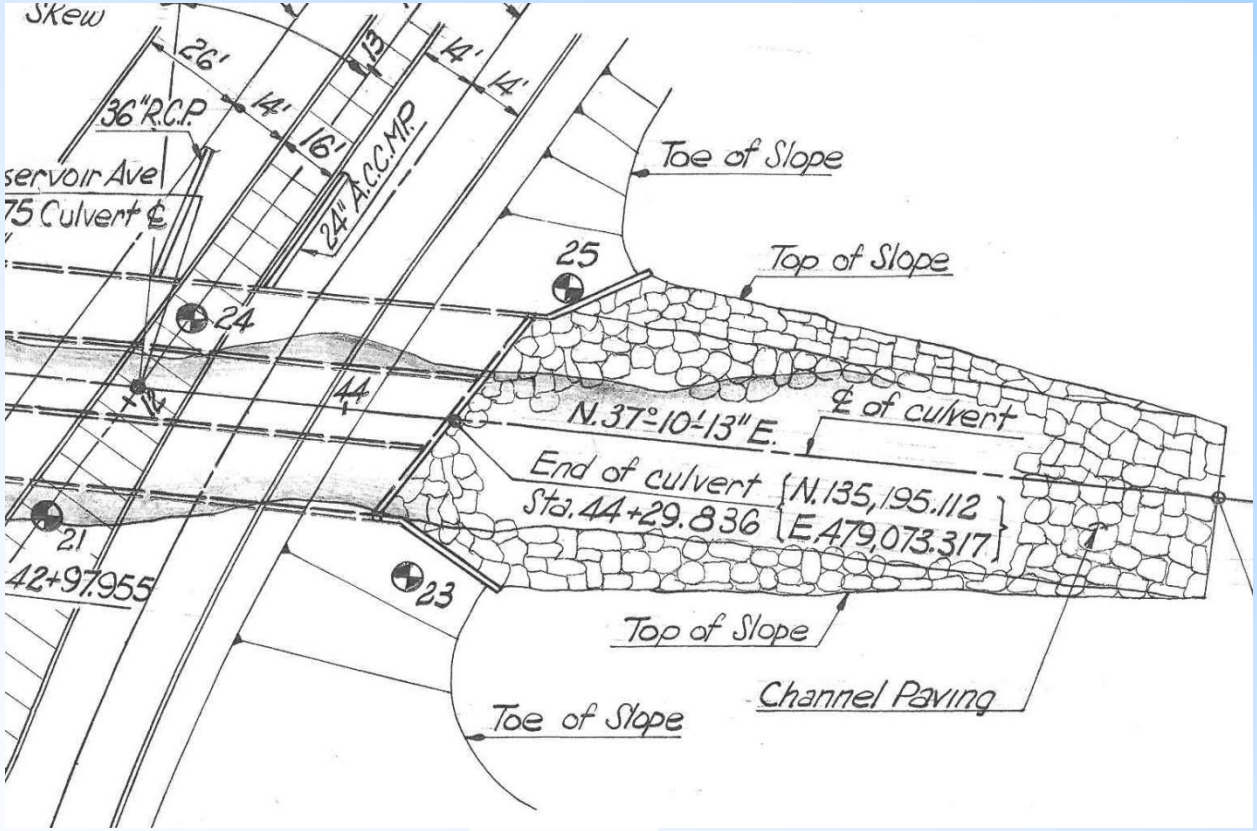
Project Overview and Goals



Project Overview and Goals

History

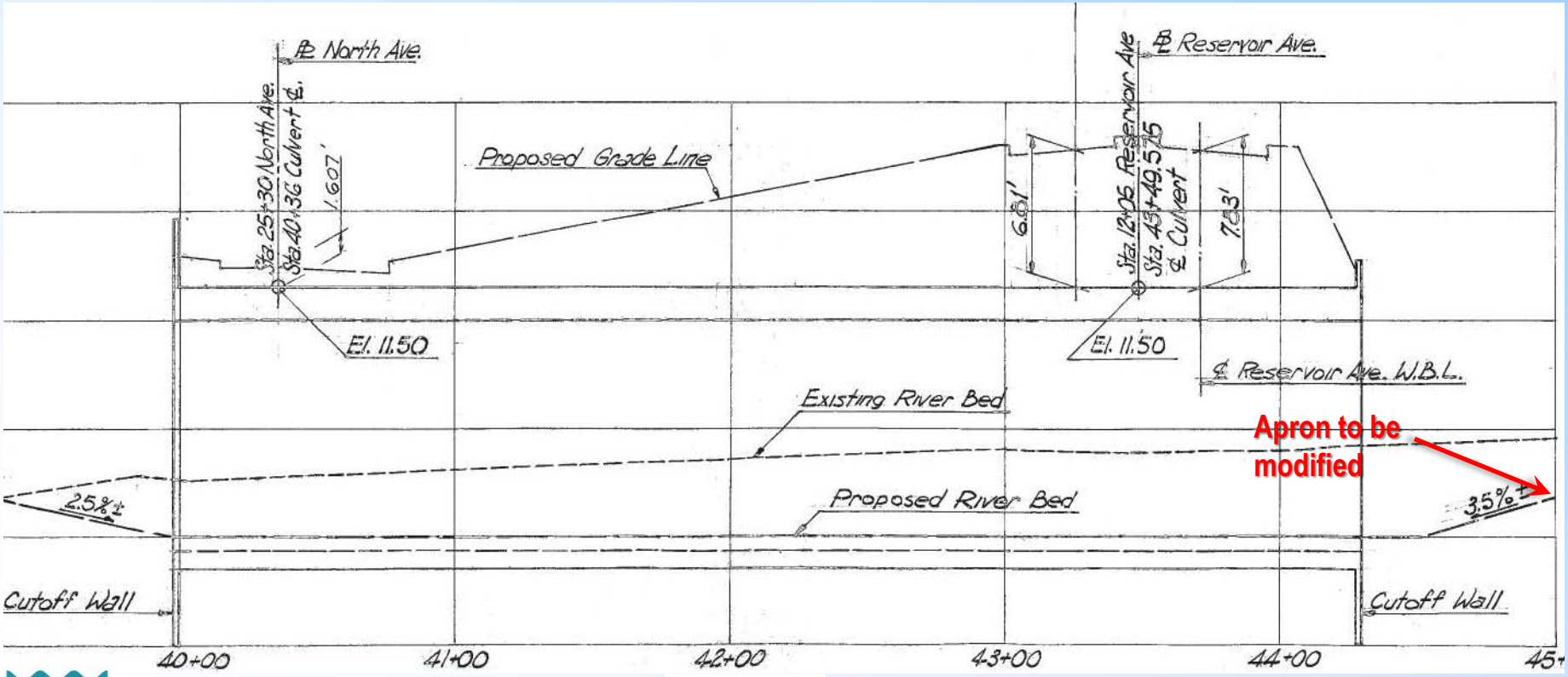
- Concrete apron installed in the 1980s to minimize erosion



Project Overview and Goals

History (cont'd)

- The river was lowered to go under the roadways



Project Overview and Goals

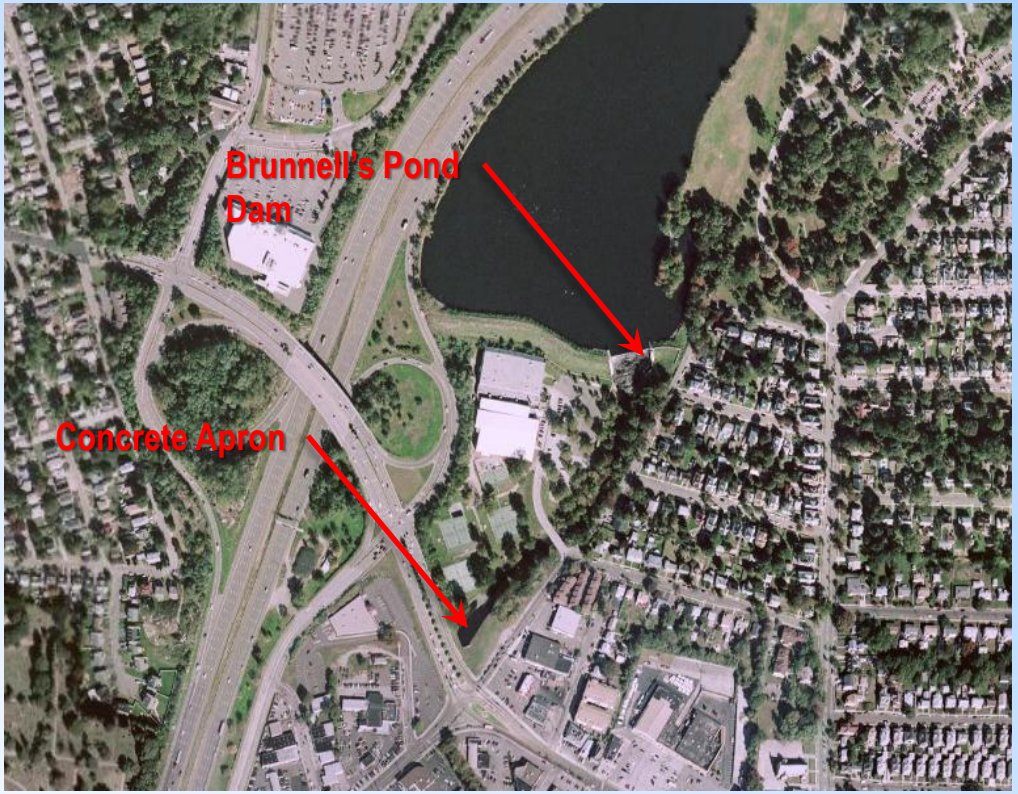
History (cont'd)

- Water levels too shallow for migratory fish during low-flow conditions
- During upstream migration, fish are forced to swim on their sides, causing injury or death
- Fish are easy targets for predators

Project Overview and Goals

Project Goal

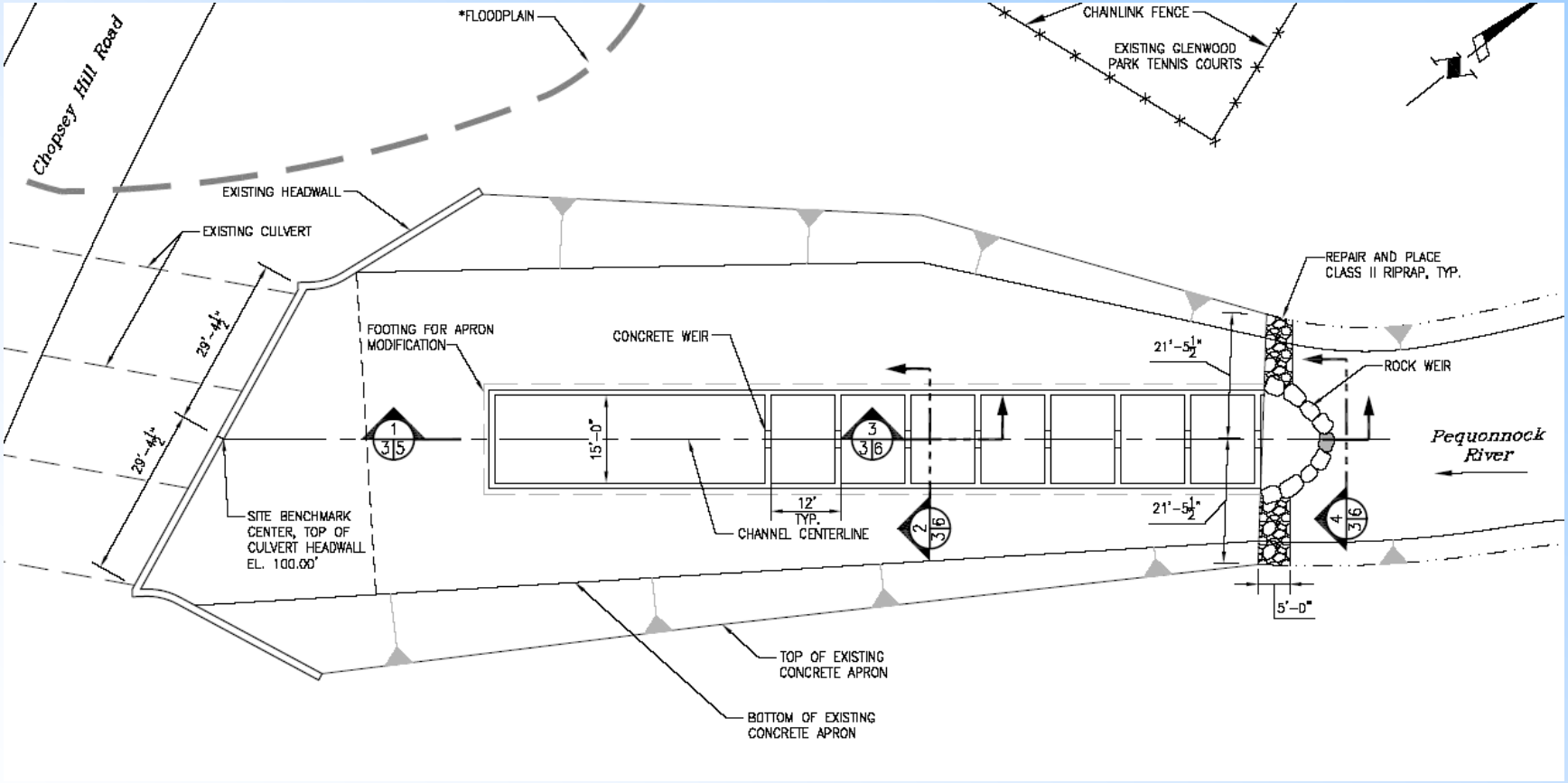
- Modify the concrete apron to enhance fish passage during all flow conditions – especially low-flow
- Allow migrant fish safe passage to Brunnell's Pond and open up 5 miles of the Pequonnock River



Fishway Design Considerations

- Maintain existing erosion control within the apron
- Protect the existing downstream culvert
- Meet the velocity and depth design criteria for the target species (river herring)
- Low maintenance and adjustable design
- Drainage area of 24.7 mi^2

Fishway Design



Fishway Design Criteria

Maximum Design Velocity of 5 ft/s

Energy Dissipation Factor (EDF) less than 4

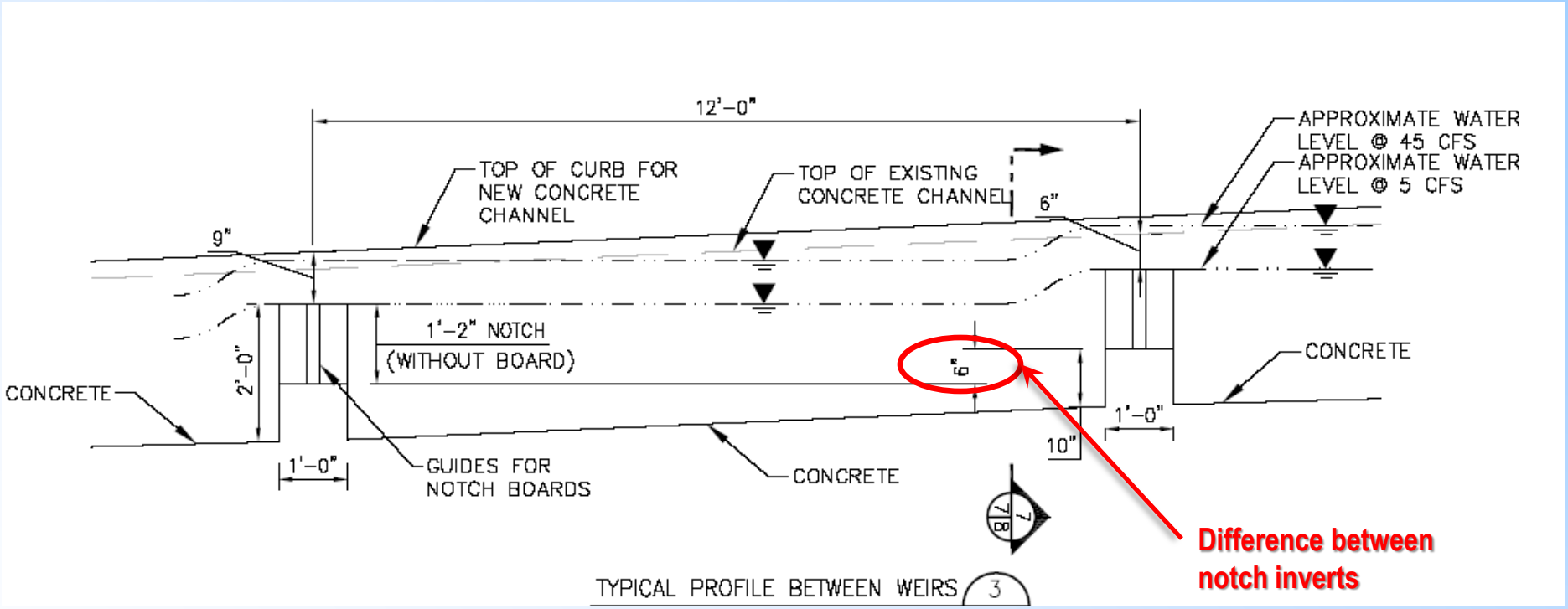
Minimum Water Level Depth of 8 inches

Fish Passage Design Flows

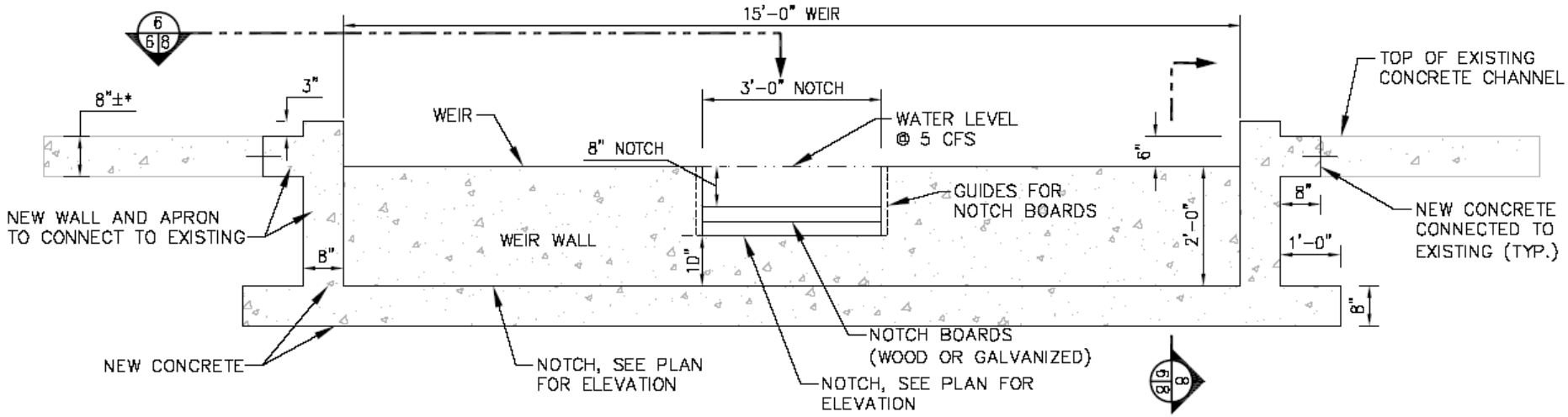
- Minimum Design Flow = 5 cfs
- Normal Design Flow = 45 cfs
- Maximum Design Flow = 178 cfs

Criteria was coordinated with CTDEP, USFWS, and STS

Fishway Design – Weir Design



Fishway Design - Weir Design



*CONTRACTOR TO NOTIFY THE ENGINEER IF THE EXISTING APRON IS LESS THAN 8" THICK

TYPICAL WEIR CROSS SECTION (2/3|6)

SCALE: ½"=1'

Maximum Design Velocity = 5 ft/s

Weir	Flow in Fishway, cfs		Flow on Apron, cfs		Depth of Water over Weir, ft		Depth of Water on Apron, ft		Velocity, ft/s		
	@ 5 cfs	@ 45 cfs	@ 5 cfs	@ 45 cfs	@ 5 cfs	@ 45 cfs	@ 5 cfs	@ 45 cfs	@ 5 cfs	@ 45 cfs	@ 178 cfs
1	5	28	0	17	0	0.63	0	0.13	1.81	2.40	4.94
2	5	28	0	17	0	0.63	0	0.13	1.81	2.40	3.98
3	5	28	0	17	0	0.63	0	0.13	1.81	2.40	3.81
4	5	28	0	17	0	0.63	0	0.13	1.81	2.40	3.76
5	5	28	0	17	0	0.63	0	0.13	1.81	2.40	3.71
6	5	28	0	17	0	0.63	0	0.13	1.81	2.40	3.69
7	5	28	0	17	0	0.63	0	0.13	1.81	2.40	3.68
8	5	28	0	17	0	0.63	0	0.13	1.81	2.40	3.68
Rock	5	34	0	N/A	0	0.50	0	N/A	1.81	2.40	2.35

Fishway Design - Pool Design

What is EDF?

- Measures the average pool turbulence in a pool and weir fishway (USFWS)

$$EDF = \frac{Q \times W \times D}{V}$$

Where:

Q = Fishway Flow (cfs)
W = Unit weight of water (62.4 lb/ft³)
D = Drop per pool (ft)
V = Pool Volume (ft³)

Maximum of 4 ft-lb/sec per unit of pool volume

Weir	Downstream Pool Size		Downstream Pool Depth		EDF	
	Length, ft	Width, ft	@ 5 cfs	@ 45 cfs	@ 5 cfs	@ 45 cfs
1	48.5	15	1	1.63	0.21	1.18
2	12	15	1.5	2.13	0.14	3.66
3	12	15	1.5	2.13	0.14	3.66
4	12	15	1.5	2.13	0.14	3.66
5	12	15	1.5	2.13	0.14	3.66
6	12	15	1.5	2.13	0.14	3.66
7	12	15	1.5	2.13	0.14	3.66
8	12	15	1.5	2.13	0.14	3.66
Rock	12	15	1.5	2	0.14	2.89

Project Status

STS is acquiring all the necessary permits this summer

EA will complete the 100% design and specifications once permits have been approved

Construction in Summer of 2012